Robert B. Adams, Ph.D.
robert.b.adams@nasa.gov

EDUCATION

UNIVERSITY OF ALABAMA IN HUNTSVILLE — **Huntsville, AL**

- Doctor of Philosophy (Mechanical Engineering) GPA: 3.79 — August 2008
  Dissertation: *Theoretical and Computational Considerations for the Medium Thrust Two-Body Problem*
  Coursework: Astrodynamics, Plasma Physics, Computational Fluid Dynamics, Magneto-hydrodynamics, Numerical Methods
- Master of Science (Aerospace Engineering) GPA: 3.79 — June 2000
  Thesis: *Preliminary Analysis of a Fusion-Powered Trans-atmospheric Air-breathing Vehicle*
  Coursework: Fluid Mechanics (Compressible, Hypersonic, Aero-thermodynamics), Advanced Aerodynamics, Propulsion (Solid, Liquid, Advanced, Nuclear), Continuum Mechanics, Engineering Mathematics

UNIVERSITY OF ALABAMA AT BIRMINGHAM — **Birmingham, AL**

- Master of Science (Mechanical Engineering) GPA: 3.81 — December 1995
  Research Paper: *A Discussion of Noise Production in Axial and Centrifugal Fans*
  Coursework: Classical Thermodynamics, Viscous and Unsteady Fluid Mechanics, Advanced Mechanical Design, Probability Mechanics, Air-breathing Propulsion, Acoustics
- Bachelor of Science (Mechanical Engineering) GPA: 2.91 — December 1993
  Senior Design Project: *A Preliminary Report on the Effects of Turbulence on the Calibration of Three Component Velocity Probes*
  Coursework: Core ME curricula plus Turbomachinery, Internal Combustion Engines, Power Generation, Vector Analysis, Thermo-dynamics of Materials, Failure Analysis, Materials Testing and Instrumentation, Biology, Organic Chemistry, Astronomy

UNIVERSITY OF TENNESSEE AT KNOXVILLE — **Knoxville, TN**

- Master of Science (Nuclear Engineering) GPA: 3.50 — December 2009
  Coursework: Reactor Design and Analysis, Radiation Protection and Dosimetry, Reliability Engineering, Reactor/ Shielding Design, Monte Carlo Analysis, Radiation Transport

UNITED STATES NAVAL ACADEMY — **Annapolis, MD**

- Bachelor of Science (Aerospace Engineering) and Bachelor of Science (Military Science) – no degree awarded — July-Oct. '89
  Coursework: Small Arms Training, Military History, Ship Handling

PROFESSIONAL EXPERIENCE

UNIVERSITY OF ALABAMA AT HUNTSVILLE — **Huntsville, AL**

Department of Mechanical and Aerospace Engineering — Jan. '04-present

Part Time Instructor

- Aircraft Stability and Control – Summer '09
- Fluids I – Fall '08
- Elements of Spacecraft Design – Spring '04, '05, '06
- Aerospace Propulsion – Summer '04, Fall '05
- Aerodynamics – Fall '04, Summer '05

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION **Huntsville, AL**
George C. Marshall Space Flight Center (Advanced Concepts Dept.) Oct. '00-present
Advanced Propulsion Technologist

- Lead several projects/studies involving up to 50-100 engineers and scientists from a number of different NASA centers, other government organizations (DOD, DOE), industry, and/or academia. Projects include:
    - The Ares V integration/verification study - incorporating nearly the entire design effort on the Ares V launch vehicle during 2008.
    - Human Outer Planets Exploration study – multicenter team developing concepts for crewed exploration of the Jovian moons and beyond.
- Lead several subteams or smaller projects of 10-20 engineers/scientists from multiple centers, industry and/or academia.
    - ONE team – created as joint NASA/USAF project in response to 9/11 attack. Lead the air launch evaluation subgroup. Conducted trajectory and sizing analyses as well as leading subteam.
    - JIMO follow on Study – lead MSFC's efforts contributing to project exploring uses for nuclear electric propulsion after the Jupiter Icy Moons Orbiter.
    - Ultra-Lightweight Solar Sail – lead multicenter team evaluating technical feasibility of extremely low areal density solar sails.
    - Planetary Body Maneuvering – comprehensive look at methods to deflect or fragment Potentially Hazardous Asteroids (PHA) that may strike the Earth.
- Lead several MSFC centered teams on a number of various topics.
    - Air Launch Concepts – further exploring possibility of launch vehicle released from spacecraft. Also conducted vehicle design and trajectory analyses.
    - NEP Study – comprehensive look at proposed NEP technologies and their potential performance enhancements for a number of proposed missions. Results to be used to guide technology development investment efforts.
    - Crewed Mars Mission – considered a number of concepts to perform an "Apollo 8"- like mission to fly to Mars, orbit, land on Phobos and/or Deimos and return crew safely to Earth.
    - OASIS – developed robotic sun-synchronous orbiter concept to detect very high energy electrons and trans-iron nuclei. To be submitted to Decadal planning team in Spring '09 for consideration for selection as future NASA mission.
    - A number of smaller projects covering a wide array of crewed and robotic mission concepts and technologies ranging from already flown to anticipated in the next 30-40 years.
- Personally conducted analyses for both launch vehicles and spacecraft.
    - Launch vehicle analyses include substantial work in trajectory analysis (POST3d, OPGUID), sizing tools (INTROS), aerodynamics (APAS) and evaluation of air-breathing and combined cycle concepts.
    - In-space vehicle analysis involves design at the conceptual level.
- Developed a number of analytical modeling tools including the PARSEC development team (http://parsec.msfc.nasa.gov). The PARSEC project created a Collaborative Engineering Environment (CEE) and suite of in-space design tools that cut analytical design times by a factor of 10. Considerable research into methods to improve human-to-human interaction in a CEE environment was conducted.
- The Multiphysics Tool Development program created structural, thermal, particle-in-cell, nuclear, radiation and compressible and incompressible fluids numerical methods tools as well as the system to link these tools together.
- All of the above efforts required extensive proposal development and project management skills.

INTERNATIONAL SPACE SYSTEMS, INC. **Huntsville, AL**
Engineering Department Feb. '99-June '00
Systems Engineer

- Principal Investigator for SBIR in advanced propulsion research. Evaluated nuclear augmented rocket based combined cycle propulsion system for launch vehicle and transatlantic vehicle.
- Developed algorithms in Tcl/Tk for the RECIPE Collaborative Engineering Environment.
- Performed trajectory analyses using POST3d including duplication of the Apollo 11 trajectory.

MCDONNELL-DOUGLAS CORPORATION/THE BOEING COMPANY **Huntsville, AL**
SpaceHAB Systems Department Oct '96-Feb '99
Systems Engineer

- Sat console (SpaceHAB Systems) for STS-91. Supported console position for STS-84, 86 and 89.
- Conducted orbiter performance assessments determining potential shuttle manifests including various SpaceHAB hardware with ISS hardware, robotic probes and other hardware
- Managed the SpaceHAB system handbook defining operations of the SpaceHAB single and double module and interfaces with shuttle subsystems.
- Calculated SpaceHAB mass properties for STS-89, 91 and supplied data for incorporation into shuttle mass properties.
- Wrote SpaceHAB mass properties database tying together contributions from SpaceHAB subsystems, structural components, and payload manifests.

BARRON INDUSTRIES, INC. **Birmingham, AL**
Sales Department Mar '95-Oct '96
Applications Engineer

- Established new single year sales record for company.
- Developed proposals for incoming requests originating from customers and outside sales representatives. Supported sales representatives in visits to customer.
- Managed projects after sale was complete including overseeing construction and traveling to customer site to troubleshoot installation/operation issues.

AWARDS, AFFILIATIONS, AND OTHER ACCOMPLISHMENTS

Professional Awards

- Rotary National Award for Space Achievement (RNASA) Stellar Team Award Nominee
- MSFC Center Director's Commendation for *Exceptional Dedication and Determination in Leading the Development of the PARSEC toolset*
- Four NASA Special Service Awards
- Four NASA Group Achievement Awards
- Three NASA Certificates of Appreciation
- MSFC Individual On-the-Spot Award
- Space Transportation Directorate Igniter Award
- Space Transportation Directorate Move the Earth Award
- Space Transportation Directorate Above and Beyond Award
- Two McDonnell-Douglas Team Awards
- ISSI Certificate of Accomplishment

Professional Affiliations

- American Institute of Aeronautics and Astronautics, *Senior Member* Aug. '94–pres.
- American Society of Mechanical Engineers, *Student Member* June '91–Dec. '95

Career Training

- Propulsion
  - Aero-Propulsion Systems, Test Technology and Eval. (40 hours)
  - Future Flight Propulsion training (16 hours)
- Vehicle Design
  - LVX (structural design software) training (8 hours)
    Space Mission Design Exercise (40 hrs)
  - Space Propulsion Analysis and Design (40 hours)
  - Human Exploration and Development of Space (40 hours)
- Design of Experiments
  - Introduction to Statistics and Analysis of Variance (40 hours)
  - Introduction to Design of Experiments (40 hours)
  - Advanced Design of Experiments (40 hours)
- Software and Programming
  - ModelCenter Introductory/Advanced Programming (40 hours)
  - Introduction to Java/ Advanced Java Programming (48 hours)
  - FORTRAN Training (40 hours)
- Systems Engineering
  - MSFC/AIAA/INCOSE systems engineering seminar series (16 hours)
  - NASA/AIAA Systems Engineering Seminar Series (16 hours)
  - Systems Engineering Overview (8 hours)
- Executive/Management
  - Executive Development Training (40 hours)
  - Contracting Officer Technical Representative (COTR) training (20 hours)
  - The Human Element (interpersonal training) (80 hours)
  - NASA New Employee Orientation (24 hours)
- Other Training
  - Design of HVAC systems (24 hours)
  - Jan Roskam's Aircraft Design Class (24 hours)

Other Accomplishments

- Professional Engineer, State of Alabama, License No. 23078 June '99 – Dec. '07
- Top Secret Security Clearance Apr. '01 - present
- Experienced in interacting with national and international press
- Programming expertise in Basic, FORTRAN, C/C++, Pascal, Java, TclTk, (X)HTML/CSS
- Versed in 3d rendering and modeling using 3ds Max, Maya and Art of Illusion
- Experienced database programmer (Paradox, Microsoft Access)

SERVICE

Academic

- Served or serving on two Master's candidate committees and one doctoral candidate committee. Serving as technical advisor on two of these committees
- Written several recommendations for former students for acceptance into graduate programs
- Mentored USNA midshipman on volunteer education effort at MSFC
- Mentored two GSRP awardees and four USRP awardees at MSFC
- Mentored two NASA Minority Outreach awardees at MSFC
- Judged demonstrations in 2008 Iowa State Science Fair

Community

- Serving as Tiger Cub Den leader for Pack 228 Cub Scouts of America
- Coached AYSO soccer team – 4-5 yr. old league "*The Starfighters*"
- Judge in 2008 Alabama First LEGO League Championships
- Participate in church led activities for community improvement and outreach

Professional

- Training/career mentoring to a number of PARSEC team members
- Supports several NASA educational outreach programs including Starship 2040 program, Student Launch Initiative, public presentations
- Nominee for AIAA Multidisciplinary Design Optimization Committee (pending review)
- Taught several internal training courses, MathCAD, PARSEC, Java, FORTRAN, etc.

PROFESSIONAL PUBLICATIONS

Books

Apr. '04 "Launch Vehicle Analysis", Chapter 3 in *Space Launch and Transportation Systems* - part of the Space Technology Series

Refereed Publications

Expected '09, "Revisiting the Oberth Two-Burn Escape Maneuver for Future Space Exploration Missions", *Acta Astronautica*, R. B. Adams, G. A. Richardson (in review)

Aug. '02 AIAA *Journal of Propulsion and Power*, "Beam-Air Interactions in a Supersonic Airbreathing Duct", R. B. Adams, D. B. Landrum

Aug. '02 AIAA *Journal of Propulsion and Power*, "Preliminary Analysis of a Fusion-Powered Earth-to-Orbit Launch Vehicle", R. B. Adams, D. B. Landrum

Invited Presentations

Oct. '08 "Continuing Efforts at MSFC Analyzing Options for Deflection of Near Earth Objects", *Asteroid Deflection Research Workshop*, R. B. Adams

Mar. '08, *Keynote Speech to Iowa State Science Fair*, R. B. Adams

Sep. '05, UAH AIAA Student Section, *"An Architecture for Crewed Exploration of the Martian Moons* (sole presenter)

May '05, Huntsville Alabama L5 Society, *"Planetary Defense against Potentially Hazardous Near Earth Objects"*, R. B. Adams

June '06 *NASA Near Earth Object Workshop*, "Summation of NASA-TP-2004-213089 Survey of Technologies Relevant to Defense from Near Earth Objects", R. B. Adams

Nov. '05 2005 Joint Army-Navy-NASA-Air Force (JANNAF) Conference, "The Need for Fusion Propulsion Research", R. B. Adams, J. Cassibry

Feb. '04 2004 *Space Technology and Applications International Forum*, "Possible Technologies that Defend Against Near Earth Objects", R. B. Adams, R. Alexander, J. Bonometti, J. Chapman, M. Devine, R. Hopkins, T. Polsgrove

Technical Memorandum/Reports

Expected '09 *Orbiting Astrophysical Spectrometer in Space (OASIS) Final Report*

Expected '08 *Ares V Integration Study Report,* NASA-MSFC

Expected '08 *NASA-TM-2008-######*, Nuclear Electric Propulsion Evolution Study, R.B. Adams, M. R. Brown, R. Chiroux, T. Crane, D. Fields, T. Moton, T. Percy, T. Polsgrove, H. D. Thomas, P. S. White

Expected '08, *NASA-TM-2008-######*, *"Options for Crewed Exploration of the Martian Moons"*

Expected '08, *NASA-TM-2008-######*, *"Investigations into Ultra Light Weight Solar Sail Technology"*

Expected '08, *NASA-TM-2008-######*, *"Conceptual Design of Launch Vehicles"*

July '04 NASA *TP-2004-213089*, "Survey of Technologies Relevant to Defense from Near Earth Objects", R. B. Adams, R. Alexander, J. Bonometti, J. Chapman, S. Fincher, R. Hopkins, M. Kalkstein, T. Polsgrove, G. Statham, S. White

Nov. '03 *NASA TP-2003-212691*, "Conceptual Design of In-Space Vehicles for Human Exploration of the Outer Planets", R. B. Adams, R. Alexander, J. Chapman, S. Fincher, R. Hopkins, A. Philips, T. Polsgrove, R. Litchford, B. Patton, G. Statham, S. White, Y. C. F. Thio

June '00 *NASA Small Business Innovative Research Phase I Report.* "Nuclear-Electric Airbreathing Engine Concept", R. B. Adams, D. B. Landrum, J. Hatfield, G. Wittenstein

Conference Papers/Presentations

Expected Mar. '09, "A Comprehensive Look at an NEO-based Exploration Architecture", *2009 Planetary Defense Conference*, R. B. Adams

Expected Aug. '09 "A New Maneuver for Exploration of the Outer Solar System", A*IAA Guidance, Navigation and Control Conference*, R. B. Adams

July '05 2005 *AIAA Joint Propulsion Conference*, AIAA-2005-4140, "The Need for Fusion Propulsion Research" R. B. Adams, J. Cassibry

July '05 2005 *AIAA Joint Propulsion Conference*, AIAA-2005-4141, "Verification of a Multiphysics Toolkit against the Magnetized Target Fusion Concept", S. Thomas, D. Britton, E. Perrell, C. Liron, R. Chiroux, J. Cassibry, R. B. Adams

Feb. '04 2004 *AIAA Planetary Defense Conference: Protecting Earth from Asteroids*, AIAA-2004-1430, "Planetary Body Maneuvering: Study Architecture and Results", R. B. Adams, R. Hopkins, T. Polsgrove, G. Statham, J. Bonometti, J. Chapman, S. White, M. Kalkstein, S. Fincher, R. Alexander

Feb. '04 *2004 AIAA Planetary Defense Conference: Protecting Earth from Asteroids*, AIAA-2004-1431, "Planetary Body Maneuvering: Threat Mitigation and Inbound Trajectories", G. Statham, R. Hopkins, R. B. Adams, J. Chapman, J. Bonometti, S. White

Feb. '04 *2004 AIAA Planetary Defense Conference: Protecting Earth from Asteroids*, AIAA-2004-1432, "Planetary Body Maneuvering: Outbound Propulsion and Trajectory Analysis", R. B. Adams, J. Bonometti, T. Polsgrove

July '03 *39th AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, AIAA 2003-4526, "Engineering of the Magnetized Target Fusion Propulsion System", G. Statham, S. White, R. B. Adams, R. Alexander, S. Fincher, A. Philips, T. Polsgrove

July '03 *39th AIAA/ASME/SAE/ASEE Joint Propulsion Conference,* AIAA 2003-4527, "Crewed Mission to Callisto Using Advanced Plasma Propulsion Systems", R. B. Adams, G. Statham, S. White, R. Alexander, S. Fincher, T. Polsgrove, J. Chapman, R. Hopkins, A. Philips

July '03 *39th AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, AIAA 2003-4694, "Planetary Defense: Options for Deflection of Near Earth Objects", R. B. Adams, G. Statham, R. Hopkins, J. Chapman, S. White, J. Bonometti, R. Alexander, S. Fincher, T. Polsgrove, M. Kalkstein

July '02 *38th AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, AIAA 2002-4233, "Trajectories for High Specific Impulse High Specific Power Deep Space Exploration", T. Polsgrove, R. B. Adams

July '02 *37th AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, AIAA 2001-3205, "Analysis of a Nuclear Powered Air-breathing Rocket for Earth to Orbit Applications", R. B. Adams, D. B. Landrum

Jan. '01 *39th AIAA Aerospace Sciences Conference*, AIAA 2001-0959, "Optimization of the SHX Fusion Powered Trans-atmospheric Propulsion Concept", R. B. Adams, D. B. Landrum

June '00 *36th AIAA/ASME/SAE/ASEE Joint Propulsion Conference*, AIAA 2000-3366, "Preliminary Analysis of a Fusion-Powered Earth-to-Orbit Launch Vehicle", R. B. Adams, D. B. Landrum

PERSONAL

- Married to the former Laura Lee Taylor, M.D.
- Son, Kyle Robert Adams, age 7
- UAB football team (tight end, inside linebacker), 1990 season
- Club level ranking – United States Chess Federation
- Avid reader of American history, biographies, science fiction

References available upon request.